

imaging line being regularly updated to provide light that produces part of the image; and

a set of shutter strips, each (a) associated with at least one of the imaging lines, (b) situated in front of each so-associated imaging line outside the image-producing component, and (c) being switched during operation of the display between a light-transmissive state and a light-absorptive state such that each shutter strip is in its light-transmissive state at least partly while each imaging line associated with that strip is providing light for creating the image, the shutter strips constituting parts of a liquid-crystal structure in which liquid-crystal material comprises host cholesteric liquid crystal and guest black dichroic dye, part of the liquid-crystal material being present in each shutter strip and, when that shutter strip is in its light-absorptive state, having a cholesteric twist whose twist pitch is no more than 5  $\mu\text{m}$ .--

Cancel Claim 41 without prejudice.

Amend Claim 42 to read as follows:

--42. (Amended) A display as in Claim 1 wherein the liquid-crystal material is capable of being controlled to selectively transmit an image defined by unpolarized light incident on the liquid-crystal material.--

Cancel Claim 43 without prejudice.

Amend Claim 44 to read as follows:

--44. (Amended) A display as in Claim 1 where the guest black dichroic dye comprises long molecules which

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roughly align with long molecules of the host cholesteric liquid crystal.--

Cancel Claim 45 without prejudice.

Amend Claim 46 to read as follows:

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--46. (Amended) A display as in Claim 1 wherein the cholesteric twist of each shutter strip in its light-absorptive state is at least 180°.--

Cancel Claim 48 without prejudice.

Amend Claims 49 - 51 to read as follows:

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--49. (Amended) A display as in Claim 1 wherein the twist pitch of each shutter strip in its light-absorptive state is no more than 3  $\mu\text{m}$ .

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50. (Twice Amended) A display as in Claim 1 wherein the liquid-crystal material is no more than 10  $\mu\text{m}$  in thickness.

C7

51. (Amended) A display as in Claim 1 wherein the black dichroic dye has a concentration of 0.1 - 10 wt % in the host cholesteric liquid crystal.--

Cancel Claim 53 without prejudice.

Amend Claims 54, 57, 97, 98, 125, and 127 to read as follows:

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--54. (Amended) A display as in Claim 1 wherein each shutter strip in the liquid-crystal structure includes:  
a different corresponding one of a set of laterally separated first electrical conductors; and  
a portion, situated opposite the corresponding first conductor, of a second electrical conductor spaced apart from

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C8 Cancel.

the first conductor, part of the liquid-crystal material being situated between the corresponding first conductor and the portion of the second conductor.

57. (Twice amended) A display comprising:  
an image-producing component having a multiplicity of imaging lines for producing an image, each imaging line being regularly updated to provide light that produces part of the image, largely all of each such image part being displayed largely simultaneously at any time when that image part is being displayed; and  
a set of shutter strips, each (a) associated with at least one of the imaging lines, (b) situated in front of each so-associated imaging line outside the image-producing component, and (c) being switched during operation of the display between a light-transmissive state and a light-absorptive state such that each shutter strip is in its light-transmissive state at least partly while each imaging line associated with that strip is providing light for creating the image, the shutter strips constituting parts of a liquid-crystal structure in which liquid-crystal material comprises host cholesteric liquid crystal and guest black dichroic dye, part of the liquid-crystal material being present in each shutter strip and, when that shutter strip is in its light-absorptive state, having a cholesteric twist whose twist pitch is no more than 5  $\mu\text{m}$ .

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C10

97. (Amended) A display as in Claim 96 wherein the liquid-crystal material comprises:  
host liquid crystal; and  
guest pleochroic dye having selectively presentable largely black and largely transparent appearance conditions.

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C11/5/21  
98. (Amended) A display as in Claim 96 wherein:  
the host liquid crystal comprises cholesteric liquid  
crystal; and  
the guest pleochroic dye comprises black dichroic dye.

125. (Twice amended) A method comprising the following  
steps for manufacturing a flat-panel display:

forming an image-producing flat-panel component having a  
multiplicity of imaging lines for producing an image such that  
each imaging line is regularly updatable to provide light that  
produces part of the image;

C12  
forming a shutter comprising a set of shutter strips that  
constitute parts of a liquid-crystal structure in which  
liquid-crystal material comprises host cholesteric liquid  
crystal and guest black dichroic dye; and

placing the shutter over the image-producing component so  
that each shutter strip is (a) associated with at least one of  
the imaging lines, (b) situated in front of each so-associated  
imaging line outside the image-producing component, and (c)  
switchable during display operation between a light-  
transmissive state and a light-absorptive state such that each  
shutter strip is in its light-transmissive state at least  
partly while each imaging line associated with that strip is  
providing light for creating the image, part of the liquid-  
crystal material being present in each shutter strip and, when  
that shutter strip is in its light-absorptive state, having a  
cholesteric twist whose twist pitch is no more than 5  $\mu$ m.

C13  
5/15/21  
127. (Twice amended) A method comprising the steps of:  
producing an image by regularly updating each of a  
multiplicity of imaging lines of an image-producing flat-panel  
component to provide light that produces part of the image;  
and

switching each of a set of shutter strips, each associated with at least one of the imaging lines and being situated in front of each so-associated imaging line outside the image-producing component, between a light-transmissive state and a light-absorptive state such that each shutter strip is in its light-transmissive state at least partly while each imaging line associated with that strip is providing light for creating the image, the shutter strips constituting parts of a liquid-crystal structure in which liquid-crystal material comprises host cholesteric liquid crystal and guest black dichroic dye, part of the liquid-crystal material being present in each shutter strip and, when that shutter strip is in its light-absorptive state, having a cholesteric twist whose twist pitch is no more than 5  $\mu\text{m}$ .--

Enclosed is an appendix which indicates how the above versions of Claims 1, 42, 44, 46, 49 - 51, 54, 57, 97, 98, 125, and 127 have been created from the previous versions of these claims. In the appendix, added material is underlined, and deleted material is in brackets.

Add new Claims 131 - 134 as follows:

--131. A display as in Claim 1 wherein largely all of the image part produced by the light provided by each imaging line is displayed largely simultaneously.

132. A display as in Claim 57 wherein the twist pitch of each shutter strip in its light-absorptive state is no more than 3  $\mu\text{m}$ .

133. A display as in Claim 57 wherein the liquid-crystal material is no more than 10  $\mu\text{m}$  in thickness.

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134. A display as in Claim 57 wherein the cholesteric twist of each shutter strip in its light-absorptive state is at least 360°.

135. A method as in Claim 125 wherein the twist pitch of each shutter strip in its light-absorptive state is no more than 3  $\mu\text{m}$ .

136. A method as in Claim 125 wherein all of the image part produced by the light provided by each imaging line is displayed largely simultaneously at any time when that image part is being displayed.

137. A method as in Claim 127 wherein the twist pitch of each shutter strip in its light-absorptive state is no more than 3  $\mu\text{m}$ .

138. A method as in Claim 127 wherein all of the image part produced by the light provided by each imaging line is displayed largely simultaneously at any time when that image part is being displayed.

139. A display comprising:

an image-producing flat-panel component having a multiplicity of imaging lines for producing an image, each imaging line being selectively activated and regularly updated to provide light that produces part of the image; and

a set of shutter strips, each (a) associated with at least one of the imaging lines, (b) situated in front of each so-associated imaging line outside the image-producing component, and (c) being switched during operation of the display between a light-transmissive state and a light-absorptive state such

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Shutter strip  
139  
140

that each shutter strip is in its light-transmissive state largely while each imaging line associated with that strip is activated and providing light for creating the image and such that, during operation of the display, each shutter strip is also in its light-transmissive state largely when each activated imaging line associated with that strip is essentially fully black.

140. A display as in Claim 139 wherein largely all of the image part produced by the light provided by each imaging line is displayed largely simultaneously.

141. A display comprising:

an image-producing flat-panel component having a multiplicity of imaging lines for producing an image, each imaging line being selectively activated and regularly updated to provide light that produces part of the image; and

a set of shutter strips, each (a) associated with at least one of the imaging lines, (b) situated in front of each so-associated imaging line outside the image-producing component, and (c) being switched during operation of the display between a light-transmissive state and a light-absorptive state such that each shutter strip is in its light-transmissive state largely while each imaging line associated with that strip is activated and providing light for creating the image and such that, during operation of the display, a variable selectable plurality of consecutive ones of the shutter strips are simultaneously in their light-transmissive states when at least one other of the shutter strips is in its light-absorptive state.

142. A display as in Claim 141 wherein the selectable

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plurality of shutter strips are simultaneously in their light-transmissive states when a variably selectable one of the imaging lines associated with that plurality of shutter strips is activated and each other imaging line associated with that plurality of shutter strips is deactivated.

143. A display as in Claim 141 wherein largely all of the image part produced by the light provided by each imaging line is displayed largely simultaneously.

144. A display comprising:

an image-producing flat-panel component having a multiplicity of imaging lines for producing an image, each imaging line being selectively activated and regularly updated to provide light that produces part of the image, the imaging lines being selectively activated in response to a multiplicity of selection signals such that each imaging line becomes (a) activated when a different corresponding one of the selection signals goes to a selection condition and (b) deactivated when the corresponding selection signal leaves its selection condition, no more than part of the selection signals being simultaneously at their selection conditions at any time during normal operation of the display; and

a set of shutter strips, each (a) associated with at least one of the imaging lines, (b) situated in front of each so-associated imaging line outside the image-producing component, and (c) being switched during operation of the display between a light-transmissive state and a light-absorptive state such that each shutter strip is in its light-transmissive state at least partly while each imaging line associated with that strip is providing light for creating the image, the shutter strips switching between their light-transmissive and light-

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absorptive states largely in response to the selection signals or/and at least one selection generation signal utilized in generating the selection signals such that each shutter strip is in its light-transmissive state at least largely while the selection signal for each imaging line associated with that strip is at that selection signal's selection condition and such that one of the shutter strips is in its light-transmissive state while the selection signal for each imaging line associated with that shutter strip is not at that selection signal's selection condition.

C14 cont  
145. A display as in Claim 144 wherein largely all of the image part produced by the light provided by each imaging line is displayed largely simultaneously.

146. A display comprising:  
an image-producing flat-panel component having a multiplicity of imaging lines for producing an image, each imaging line being regularly updated to provide light that produces part of the image, the imaging lines being selectively activated in response to a multiplicity of selection signals;  
a set of shutter strips, each (a) associated with at least one of the imaging lines, (b) situated in front of each so-associated imaging line outside the image-producing component, and (c) being switched during operation of the display between a light-transmissive state and a light-absorptive state such that each shutter strip is in its light-transmissive state at least partly while each imaging line associated with that strip is providing light for creating the image, the shutter strips switching between their light-transmissive and light-absorptive states largely in response to the selection signals

or/and at least one selection generation signal utilized in generating the selection signals; and

a control component for selectively placing the shutter strips in their light-transmissive and light-absorptive states in response to the selection signals or/and each selection generation signal, the control component comprising a group of control elements for selectively providing light that determines placement of the shutter strips in their light-transmissive and light-absorptive states.

147. A display as in Claim 146 wherein each control element is operable to provide light that causes an associated one of the shutter strips to be in a specified one of its light-transmissive and light-absorptive states.

148. A display as in Claim 146 wherein the light provided by the control elements comprises part of the light provided by the imaging lines.

149. A display as in Claim 146 wherein largely all of the image part produced by the light provided by each imaging line is displayed largely simultaneously.

150. A composite display comprising:

a generally flat image-producing component having a multiplicity of imaging lines for producing an image, each imaging line being regularly updated to provide light that produces part of the image, the image-producing component comprising one of (a) a light-emitting diode display, (b) a combination of a liquid-crystal device and a phosphor-based light-emitting device which selectively emits light when excited by light provided by the liquid-crystal device, and

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(c) a combination of a light-providing portion, an electron-emitting portion which emits electrons upon being excited by light furnished by the light-providing portion, and a phosphor-based light-emitting device which selectively emits light when struck by electrons emitted by the electron-emitting portion; and

C14 cont.  
a set of shutter strips, each (a) associated with at least one of the imaging lines, (b) situated in front of each so-associated imaging line outside the image-producing component, and (c) being switched during operation of the display between a light-transmissive state and a light-absorptive state such that each shutter strip is in its light-transmissive state at least partly while each imaging line associated with that strip is providing light for creating the image.

151. A display as in Claim 150 wherein the image-producing component employs line-at-a-time activation for updating the imaging lines.

152. A display as in Claim 150 wherein the light-emitting diode display is of organic type.

153. A display as in Claim 150 wherein the light-providing portion comprises an electroluminescent device.

154. A composite display as in Claim 150 wherein largely all of the image part produced by the light provided by each imaging line is displayed largely simultaneously.--

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